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Preschool pre-service teachers' scientific attitudes for sustainable professional development

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Abstract

The purpose of study was to identify the scientific attitudes for Sustainable Professional Development of pre-service teachers in the Preschool Education program. The research was conducted on true experimental design and we used post-test control group design, a quantitative research approach. A total number of 89 university students were included and "Scientific Attitude Inventory" (SAI-II) was used to determine the scientific attitudes of pre-service teachers. When the attitude score means of the control group were examined, it was found that the students with the highest scores from the sub-dimensions were included in the willingness to do scientific studies sub-dimension. Based on results, it is seen that the average scientific attitude scores of the experiment group is higher than the control group and scientific attitudes are important for sustainable professional development.

Keywords: Preschool education**,** pre-service teacher, scientific attitudes, sustainability, professional development

1. Introduction

1.1. Introduce the problem

Scientific attitudes and behaviors are inquisitive thoughts and behaviors that facilitate problem-solving, producing science, and briefly, transferring research and technical competencies into practice. Scientific attitudes and behaviors are indispensable not only for research or learning but also for democratic life. These are the qualifications that can be gained when giving the necessary knowledge and skills for technical competencies (Karasar, 1999). According to Kazempour (2008), the negative attitudes of the teacher candidates at the beginning of the scientific method course and their low self-competence necessitate a focus on researching whether a reform-based scientific method course would

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cause any changes in prospective teachers' beliefs, attitudes, and self-competence, and investigating possible factors that might affect such changes.

Teaching/learning processes of prospective teachers, their images about the roles of teachers and students differ because they might have experience in different teaching models and styles in their academic and professional careers. Prospective kindergarten and primary school teachers often have negative memories in the field of science teaching. They remember a strict model of science, based on axioms, principles, and laws, so they associate scientific topics with what is absolutely necessary (Pilo, Gavio, Grosso & Mantero, 2012). The way of pre-service teachers see science, their thoughts about the nature of science and scientists will affect their choice of profession and their achievements in this field. Therefore, scientific attitudes of students, their views on the nature of science and scientists are frequently researched (Demirbaş, 2009).

Titrek and Cobern (2011) stated that the focus needs to be on the opinions of pre-service teachers because they encourage students' attitudes towards science at an early age as part of their principal role as prospective pre and primary school teachers. Stollberg (1969) expressed that teacher's exhibit a negative or impartial attitude towards science often convey this attitude to their students. Campbell and Martinez-Perez (1976) claim that acquiring scientific knowledge is related the person provides the teaching, especially the in the early ages. The research findings of Titrek and Cobern (2011) reflect that in a particular model of public science from early ages.

The act of providing students with scientific attitudes should be carried out systematically at all levels of education starting from preschool education, not a certain level of education or program. Indeed, one of today's serious social problems is how we can protect our planet's resources and improve prosperity for a growing population at the same time (Caradonna, 2014). UNESCO (2012) stated that the self-qualifications of teachers in this case specifically include the potential to influence pedagogical information in sustainability training (ST). The area of sustainability training especially emphasizes the need for alternative and student-centered pedagogical methods in contrast to traditional teaching. Teachers are more likely to adopt and apply alternative teaching methods when they rely on their ability to control their classrooms and influence student learning. The teacher is the most important factor in ST because teachers are in a position to create better educated future generations. The quality of the teacher depends on factors such as teacher recruitment, teacher certification, and teachers' salary. However, professional development is the most critical factor due to constant social changes and the implementation of alternative pedagogical approaches in sustainable education (Choi & Kang, 2019).

Moreover, "2030 Sustainable Development Goals" signed by 193 countries at 2015 and the 2030 Agenda for Sustainable Development is an ambitious, selfless and universal agenda that will eliminate poverty through sustainable development by 2030 (UNESCO,

2019). The importance of placing sustainable education in the educational system for sustainable development is emphasized. Nowadays, it is suggested that teacher training in the establishment of education for sustainable development is associated with focusing on the teachers' professional competencies (Dahl, 2019).

Ekiz (2009) argued that for sustainable professional development in education is important that the scientific attitude and behavior that will contribute to the professional development of pre-service teachers to be acquired in the process of teacher training. Although it is important to pay attention to the attitudes of primary education teachers towards science and service, progress in the field of research has been slow due to poor identification and conceptualization of primary education teacher's attitudes towards science. This weak theoretical background has led to the use of a large number of different concepts and measurement tools. In the given study, a new and comprehensive theoretical framework for the attitude of primary teachers towards science is presented (Van Aalderen-Smeets, Walma van der Molen, & Asma, 2012).

According to Reynolds (1996), the role of teacher training in the formation of professional identity is ambiguous. The process (preschool education) seems to be a complex socialization process connected with the institution's expectations, teacher training and government requirements (Sundberg & Ottander, 2013). Based on the literature, it can be said that certain pedagogical tools in ESD (Education for Sustainable Development) for ECE (Early childhood education) are the key to professional development (Bascopé, Perasso & Reiss, 2019). Because sustainable education is the beginning of each person's professional identity and career as well. Professional identity is a formed over time (Carter & Doyle, 1996, as cited in Sundberg & Ottander, 2013) and is influenced by both professional and personal development (Clarke, & Hollingsworth, 2002) adaptation to the perceived culture and the values of the collective community where students find themselves seems to be integrated with how prospective teachers form their professional roles (Fleer, 2009). Therefore, it seems appropriate to investigate the changes in pre-service teachers' competence, confidence and attitudes in science, teaching of science and their role as teachers during their work as a social participation process, including the dimensions of sociocultural and established learning (Lave & Wenger, 1991; Sundberg & Ottander, 2013).

Sundberg and Ottander's (2013), research is synchronized with inadequate science teaching in preschool education. Here, students were asked whether they were actively involved in any scientific activity as preschool teachers in their first year. Fifty-four percent stated they did not participate in any scientific activity. Moreover, Dahl's (2019), research investigated 578 pre-service teachers in seven different teachers training programs in Europe, as well as surveying the students' ability to work as teachers, and their ability to teach methods that care about sustainability and promote environmentally healthy lifestyles. The results of the survey show that pre-service

teachers have good preparation to address many aspects of teacher professionalism, but are less ready to train for sustainability. The survey also shows that the pre-service teacher who is continuing education for sustainability is not integrated into his other training topics and is often newly included in the programs such as attitudes towards science. Data obtained from seven different teacher training programs in Europe show that it is possible to measure how students think their training prepares them to work as teachers throughout different aspects of teacher professionalism. The data shows that the ideas of students on being prepared to work as a teacher can be listed according to four different dimensions: teaching to meet the differences between students, having a critical approach as a teacher, improving as a teacher and teaching for a sustainable society (Dahl, 2019).

Pre-school education programs in Turkey had been developed since the 1990s and recently, referring to scientific developments and taking into consideration new educational approaches, took its final form in 2013 (MEB, 2013). The same case is observed in higher education programs as well and in 1997, with the restructuring of faculties of educational sciences, teacher training programs were renewed and in the light of 2018 teacher-training policies, studies for new programs to train qualified teachers for early childhood education continue to this day (YÖK, 2018). Research on determining the level of scientific attitudes in terms of designing a vision to the above-mentioned literature and pre-school sustainable teacher training program renewal studies are important. The most important element of sustainable education is the teacher and training of the teacher. The preschool teacher with a scientific attitude is the key and the starting point of sustainable education. Therefore, determining the attitudes of all teacher candidates towards science for sustainable pre-school education is the most important research topic of sustainable education.

1.2. Research Aim and Questions

The purpose of research is to determine the scientific attitudes of preschool pre-service teacher who attend and did not attend the course about "Child and Family Research Project" in the Preschool Education Undergraduate Program for Sustainable Professional Development. For this purpose, the scientific attitudes of pre-service teachers were investigated according to the following research questions;

1-What level were the scientific attitudes of preschool teacher candidate's part in the control group?

2- What level were the scientific attitudes of preschool teacher candidate's part in the experiment group?

3- Was there a difference between the scientific attitudes of preschool teacher candidate's part in the experiment and the control group?

4- Did the scientific attitudes of preschool teacher candidate's part in the experiment and the control group differ according to their demographic variables?

2. Method

The research is designed using a post-test control group model from experimental patterns. "The post-test control group model is used effectively especially in cases when it is predicted that the pre-test will not be necessary and it will have a negative impact either within the application or at the end of the application" (Tanrıöğen, 2009).

2.1. Participant (subject) characteristics

This research was conducted with senior year pre-service teachers from Sakarya University Faculty of Education. In the study, a control group and an experimental group were created by the method of unbiased assignment. As some students' answers to the scale applied to pre-service teachers who participated in the research were incomplete or incorrect, these scales were not evaluated. As a result of the scales, 53 pre-service teachers participated in the test group, and 36 pre-service teachers participated in the control group, so, a total of (n=89) preschool teacher candidates participated in the study.

2.2. Sampling procedures

Preschool pre-service teachers attended the "Child and Family Research Project" elective course participating in the research constitute the experimental group and the ones who did not take the course constitute the control group. Pre-service teachers participated to the course were informed about science and research methods for a period of 14 weeks, and they designed and applied a research topic they determined. There are statistical distributions of frequency, percentage and arithmetic means of the following variables: the preschool teacher candidate's gender, class, the type of high school where they graduated from, and their answers to "Have you taken a course of scientific research methods?" and "Would you like to conduct scientific research?"

2.2.1. Sample size, power, and precision

Pre-service teachers in the experimental group n=53 account for (60%) of the group, while the control group pre-service teachers n=36 account for (40%) of the group. When we look at gender distributions of preschool teacher candidates participating in the study in the experimental and control group, women account for n=76 (85%) of the group, while men constitute n=13 (15%); in terms of age, 20-22 years constitute (74%), 23-25 years constitute (16%), 26-30 years constitute (6%), and ages 31 and older constitute (4.5%); in terms of the high school type they graduated from, we see Anatolian High School, with (31,5%), Anatolian Teacher Training High School with (13,5%), Anatolian Religious High School with (3%), Vocational High School with (40%), and Other with (11 %). Whereas the pre-service teachers who answered "yes" to the question "Did you take the Scientific Research Methods course?" constitute the (97%) of the group, the teacher candidates who

answer “no” formed the (3%) of the group. While the teacher candidates who answered "yes" to the question “Would you like to do scientific research?” constitute (65%) of the group, the teacher candidates who answer “no” constitute the (35%) of the group.

2.2.2. Measures and covariates

Personal information form developed by the researcher for preschool pre-service teachers consists of seven questions about the students’ gender, age, educational background, classes and courses they take. In addition, to identify the scientific attitudes of pre-service teachers’ studying in the senior year of preschool education, the 40-point "Scientific Attitude Inventory "(SAI II) that was developed by Moore and Foy (1997) and adapted to Turkish language by Demirbaş and Yağbasan (2006) was used. The 40 items on the scale were structured to explain how students feel about the nature of sciences, the way scientists work, and the physical sciences. Scores were formed in a five-point Likert type, and the agreement degrees of persons to the points were classified as “I Strictly Agree”, “I Agree”, “I am Undecided,” “I Disagree,” and "I Strongly Disagree.” The (SAI II) items included in the scale, 20 of them were identified as positive and 20 were negative. In the scoring of the answers given by the pre-service teachers, a form of scoring for positive points were considered as 5, 4, 3, 2, 1, and for negative points, scoring was in the form of 1, 2, 3, 4, 5. The highest and lowest scores from the scientific attitude scale ranges between 40 and 200. Also the scale is divided into 6 subscales and 5 of the subscales are related to the nature of physical sciences and the way scientists work; while 1 subscale included points related to how students feel about science. The Scientific Attitude Scale Kaiser-Mayer-Olkin (KMO) value is 0.862, and Barlett is (526.431). These values obtained were found to be high values. In relation to the reliability of the scientific attitude scale, Cronbach's Alpha reliability coefficient was found to be 0.76 ($\alpha = 0.76$). Spearman-Brown two semi-test correlations were found to be 0.84 (Demirbaş & Yağbasan, 2006).

3. Results

3.1. Statistics and data analysis

3.1.1 According to the statistical analysis on the level of scientific attitudes of preschool teacher candidates in the control group, we found a significant result them below;

Based on the means of pre-service teachers in the control group, while in the sub-dimension of “Scientific Laws and Structure of Theories” $\bar{x}$= 20,08, it is $\bar{x}$=22,36 in “Structure of Sciences and Approach to Events,” and $\bar{x}$=23,42 in “Exhibition of Scientific Behavior,” whereas it is $\bar{x}$=19,30 in “Structure and Purpose of Sciences” and $\bar{x}$=20,63 in “Place and Importance of Sciences in Society, ”$\bar{x}$=31,05 in “Willingness to do Scientific Studies,” and based on the total scores, it was found to be $\bar{x}$=136,86.

Given the means of Scientific Attitudes of the control group, that is the pre-service teachers who received the highest scores were from the "Exhibition of Scientific Behavior" $\bar{x}$=23,42 (78%). The lowest means were seen under the "Willingness to do Scientific Studies" sub-dimension $\bar{x}$=31.05; (62%). Based on total scores, it is seen that the means of scientific attitudes scores of control group is $\bar{x}$=136. Since the maximum score from the scale is 200, it can be said that the scientific attitudes of the pre-service teachers are at a high level.

3.1.2 According to the statistical analysis on the level of scientific attitudes of preschool teacher candidates in the experiment group, we found a meaningful result below;

Based on the means of pre-service teachers in the experiment group, while in the sub-dimension of "Scientific Laws and Structure of Theories" $\bar{x}$= 19,90, it is $\bar{x}$=23,28 in "Structure of Sciences and Approach to Events," and $\bar{x}$=23,84 in "Exhibition of Scientific Behavior," whereas it is $\bar{x}$=19,22 in "Structure and Purpose of Sciences" and $\bar{x}$=21,05 in "Place and Importance of Sciences in Society, "$\bar{x}$=33,86 in "Willingness to do Scientific Studies," and based on the total scores, it was found to be $\bar{x}$=141,18.

Given the means of Scientific Attitudes scores of the experimental group, that is, the pre-service teachers received the highest scores were from the "Scientific Behavior Exhibit" $\bar{x}$=23,84 (79%). The lowest means were seen under the Structure and Objectives of Physical Sciences were $\bar{x}$=19.22 (64%). Based on total scores, it is seen that the means of scientific attitudes of the experimental group was $\bar{x}$=141. Since the maximum score from the scale is 200, it can be said that the scientific attitudes of the pre-service teachers attended the course are at a high level.

3.1.3 Was there a difference between the scientific attitudes of preschool teacher candidates taking part in the experiment and the control group?

Whether there is a difference between the scientific attitudes scores of pre-service teachers were evaluated based on t-test results for independent samples. When the scientific attitude scores of pre-service teachers were examined, a significant difference in the levels (t=2,227; p< ,05; p=,029) was found in favor of the test group, which is the prospective teachers who attend the course. Given the total scores, it was seen that the means of scientific attitudes scores of the experimental group was $\bar{x}$=141. As the scientific attitudes of control group was $\bar{x}$=136, it can be said that the scientific attitude level of the group of experimental group means are higher than control group students.

According to the t-test results of the scientific attitudes scale used in the research (see Table 1.), when the difference between the means of 6 dimensions were examined, only in the "Willingness to do Scientific Studies" was there a significant difference in the levels of

control and experimental group pre-service teachers (t=2,395; p< .05; p=.019). The means of the experimental group was $\bar{x}$=33,867 whereas the scientific attitude sub-dimension means of the control group was found to be $\bar{x}$=31,055. According to this result, a significant result was found in favor of the pre-service teachers attend the course in the sub-dimension of "Willingness to do Scientific Studies." The desire to do scientific studies was higher in the experimental group than control group.

Table 1. Scientific attitude score of pre-service teachers t-test results

	Group	N	$\bar{x}$	SD	t	df	p
Structure of Scientific Laws and Theories	Experimental Group	53	19.905	2.49	.319	87	750
	Control Group	36	20.083	2.63			
Structure of Physical Sciences and Approach to Events	Experimental Group	53	23.283	2.97	1.636	87	106
	Control Group	36	22.361	2.33			
Exhibition of Scientific Behavior	Experimental Group	53	23.849	2.55	.800	87	426
	Control Group	36	23.416	2.46			
Structure and Purpose of Physical Sciences	Experimental Group	53	19.226	2.40	.166	87	869
	Control Group	36	19.305	2.06			
The Place and Importance of Physical Sciences in Society	Experimental Group	53	21.056	2.90	.721	87	473
	Control Group	36	20.638	2.52			
Willingness to Do Scientific Studies	Experimental Group	53	33.867	6.23	2.395	87	019**
	Control Group	36	31.055	4.81			
TOTAL	Experimental Group	53	141.188	10.506	2.227	87	029**
	Control Group	36	136.861	7.805			

*p<.01, **p<.05

3.1.4 Findings on whether scientific attitude scores of preschool teacher candidates participating in experimental and control groups differ according to demographic characteristics.

Whether there is a significant difference between pre-service teachers in the experimental and control group of the study according to their demographic characteristics was examined using two-way variance analysis. According to these test results, no significant results were found between the means in terms of gender, class, age and the type of high school they graduated from. The variance analysis result regarding whether the Scientific Attitude means of the experimental group and control group significantly differentiated according to the "Did you take the Scientific Research Methods course?" variable is shown in Table 2 below.

As seen in Table 2, there was a significant difference between experimental and control groups [$F_{(8,655)}$ =.004; p<0.01]. When the attitude scores obtained from the scientific attitude scale of the experimental and control group were compared, a significant

difference was identified between the scores based on the common effect of the group [$F_{(5,511)}$ =.021, p<0.05]. When we examined the means to see which group this difference was in favor of, it was found that the mean experimental group ($\bar{x}$=140,627) were higher than control group ($\bar{x}$=137,200).

Table 2. Results of the Two-Way Variance Analysis regarding "Did you take the Scientific Research Methods course?" about Experimental and Control Groups

Source of Variance	Sum of Squares	df	Mean of Squares	F	p
Corrected Model	971.899	3	323.963	3.771	.014
Intersection	201352.355	1	201352.355	2701.074	.000
Experimental/Control	743.500	1	743.500	8.655	.004
Did you take the Scientific Research Methods course?	4.613	1	4.613	.054	.817
Group * "Did you take the Scientific Research Methods course?	473.410	1	473.410	5.511	.021**
Error	7302.022	85	85.906		
Total	8273.910	89			
Levene Test					.102

*p<.01, **p<.05

According to the results of Levene test statistics and two-way variance analysis in Table 3, there was no significant difference in terms of experimental and control groups [$F_{(0,003)}$=,955, p>0,05]. When the attitude scores for "The Place and Importance of Physical Sciences in Society" sub-dimension obtained from the scientific attitude scale of experimental group and control group were compared, a difference based on the common effect group [$F_{(4,149)}$=,045, p<0,05] was identified. When we examined the means to see which group this difference was in favor of, it was found that the mean group scores of experimental group ($\bar{x}$=21,425) were higher than control group ($\bar{x}$=20,111). According to this result, the research project course has an effective content on "The Place and Importance of Physical Sciences in Society".

Table 3. Results of the Two-Way Variance Analysis "Importance of Science in Society" and "Would You Like to Conduct Scientific Research?" variable about Experimental and Control Groups

Source	Sum of Squares	df	Mean Square	F	P
Corrected Model	35.901	3	11.967	1.617	,191
Intercept	32046.649	1	32046.649	4330.794	,000

Experimental/Control	,023	1	0.23	,003	,955
Would you like to do scientific research?	,935	1	,935	,126	,723
Group * Would you like to do scientific research?	30.703	1	30.703	4.149	,045**
Error	628.976	85	7.400		
Total	39495.000	89			
Levene Test					,613

*p<,01, **p<,05

Based on Table 4, a significant difference was found regarding the "Exhibition of Scientific Behavior" sub-dimension attitude scores according to Levene test statistics and the results of two-way variance analysis in terms of experimental and control groups [$F_{(4,788)}$=,031; p<0,05]. When the attitude scores of "Exhibition of Scientific Behavior" sub-dimension obtained from the scientific attitude scale of the experimental and control group were compared, a difference was identified between the scores based on the common effect of group. When we examined the means to see which group this difference was in favor of, it was found that the means of experimental group ($\bar{x}$=23,705), were higher than control group ($\bar{x}$=23,485). According to this result, we can explain the fact that students who had taken the research project course had high attitude scores in the "Exhibition of Scientific Behavior" sub-dimension with the effectiveness of the course content.

Table 4. Results of the Two-Way Variance Analysis regarding the Scientific Attitudes of Pre-service Teachers along with "Exhibition of Scientific Behavior" about the Experimental and Control Groups

Source of Variance	Sum of Squares	df	Mean Square	F	P
Corrected Model	37.719	3	12.573	2.064	,111
Intercept	5914.613	1	5914.613	970.861	,000
Experimental/Control	29.170	1	29.170	4.788	,031
Did you take the Scientific Research Methods course?	1.106	1	1.106	,182	,671
Group * Did you take the Scientific Research Methods course?	25.473	1	25.473	4.181	,044**
Error	517.831	85	6.092		
Total	50437.000	89			
Levene Test					,306

*p<,01, **p<,05

As seen in Table 5, in terms of "Structure and Purpose of Physical Sciences" means and according to the Levene test statistics and two-way variance analysis, there was a significant difference between experimental and control groups [$F_{(6,405)}$=,013; p<0,05]. When the "Structure and Purpose of Physical Sciences" scores of experimental and control group were compared, a difference was identified between the scores based on the common effect of group. When we examined which group this difference is in favor of in terms of mean scores, the group mean scores of the experimental ($\bar{x}$=19,000), found to be lower than the control group ($\bar{x}$=19,342). The fact that scientific attitude scores of the pre-service teacher in the control group took the Scientific Research Methods course before were high can be explained by the previous knowledge and attitudes that the students had. Or, the lower scores that the pre-service teachers experimental group "Structure and Purpose of Physical Sciences" sub-dimension can be explained by the inadequate content of the research project course on this topic.

Table 5. Results of the Two-Way Variance Analysis regarding "Structure and Purpose of Science" about the Experimental and Control Groups

Source of Variance	Sum of Squares	df	Mean Square	F	P
Corrected Model	71.170	3	23.723	5.308	.002
Intercept	4273.833	1	4273.833	956.277	.000
Experimental/Control	28.626	1	28.626	6.405	.013
Did you take the Scientific Research Methods course?	14.009	1	14.009	3.135	.080
Group * Did you take the Scientific Research Methods course?	34.826	1	34.826	7.792	.006*
Error	379.886	85	4.469		
Total	33460.000	89			
Levene Test					.331

*p<.01, **p<.05

4. Discussion

In view of the results of scientific attitudes, the scientific attitude scores of preschool pre-service teachers were examined and a significant difference was found in favor of the experimental group. When we check the means of both groups, it was found that the scientific attitudes of pre-service teachers were high in general. When we look at the literature, the scientific attitude scores of pre-service teachers were high in a lot of

research results (Bodzin & Gehringer, 2001, Scherz & Oren, 2006, Kang, Schorman, & Noh, 2005, Eijck, Hsu & Roth, 2008, Smith & Erb, 1986, Flick, 1990, Demirbaş, 2009). We can claim that Turkish education system is sufficient to develop scientific attitudes at all levels starts from preschool education, although some studies have the opposite results of our current findings (Harlen & Holroyd, 1997; Palmer, 2004; Shrigley, 1983; Trumper, 1998).

Given the means of scientific attitudes of the control group was found that the pre-service teachers received the highest scores from the sub-dimensions took place in the "Exhibition of Scientific Behavior" sub-dimension. The lowest mean was seen in the sub-dimension of "Willingness to do Scientific Studies." Given the mean scientific attitudes scores of the experimental group, that is, experimental group pre-service teachers, it was found that pre-service teachers received the highest scores from the sub-dimensions took place in the "Exhibition of Scientific Behavior" sub-dimension. The lowest mean score was seen in the sub-dimension of the "Structure and Purpose of Physical Sciences." In Güzel's (2001) study researching the views of science teachers on the nature and characteristics of science, the majority of teachers said science is a whole of knowledge. The majority of teachers also expressed the opinion that the observations of scientists would be the same, regardless of the theory they believe in. The generally high willingness of pre-service teachers to exhibit scientific behavior coincides with these findings. In order to determine the students' knowledge about any subject, first teachers must be equipped.

When the scores obtained from the scientific attitude scale used in the research are examined for both groups, the only difference between the means of six sub-dimensions was found in the "Willingness to do Scientific Studies" dimension. Based on the result scientific attitudes of experimental group was higher than the means of control group significantly. Given the means of scientific attitudes of the control group, that is, the control group, it was found that the pre-service teachers received the highest scores from the sub-dimensions took place in the "Exhibition of Scientific Behavior" sub-dimension. The lowest mean score was seen in the sub-dimension of "Willingness to do Scientific Studies."

According to the research findings, there was no significant difference between the scientific attitude scores of pre-service teachers in terms of gender, class, age and the type of high school they graduated from variables. Erdoğan's (2017) research results also support our findings. It was found that the scientific attitudes of gifted pre-service teacher are at a good level and that the gender factor does not make a significant difference in the scientific attitude. Moreover, when the "Place and Importance of Physical Sciences in Society" sub-dimension attitude scores were compared, no significant difference was found between groups (experimental/control).

When the "Place and Importance of Physical Sciences in Society" sub-dimension attitude scores obtained from the scientific attitude scale of experimental and control group were compared in terms of the question "Do you want to do scientific research?", it was determined that there was a difference between the scores. When we examined the means to see which group this difference was in favor of, it was found that the mean group scores of the experimental group were higher than that of the control group. According to this conclusion, it can be said that the research project course has an effective content in terms of "The Place and Importance of Physical Sciences in Society" (Demirbaş & Yağbasan, 2006).

There was a significant difference between groups (experimental/control) in terms of attitude scores of the "Exhibition of Scientific Behavior" and sub-dimension. When we examined the means to see which group this difference was in favor of, it was found that the mean group scores of the experimental group were higher than that of the control group. According to this result, we can claim that experimental group scientific attitude scores of the "Exhibition of Scientific Behavior" sub-dimension is higher than control group about effectiveness of the course content (Demirbaş & Yağbasan, 2006). The research findings of Sundberg and Ottander (2013) also support our results. At the beginning of science courses, pre-service teachers have the opinion that knowledge of scientific content can be useful in their daily lives. The fact that pre-service teachers have a positive attitude towards science may be explained by the fact that at least some of pre-service teachers have a positive attitude towards sciences.

According to the results of the analysis in terms of "Structure and Purpose of Science" sub-dimension scores, a significant difference was found in terms of groups (experimental/control). When we examined the mean scores to see which group this difference was in favor of, it was found that the mean group scores of experimental group were lower than control group. The fact that scientific attitude scores of the pre-service teachers in the control group was high and it can be explained by the previous knowledge and attitudes that the students had. Or, the lower scores that the teacher candidates who took the course got in the "Structure and Purpose of Physical Sciences" sub-dimension can be explained by the inadequate content of the research project course on this topic.

There was a significant difference about of scientific attitudes in terms of groups (experimental/control). When the attitude scores were compared in terms of "Did you take the scientific research methods course?, it was determined that there was a difference between the scores. When we examined the means to see which group this difference was in favor of, it was found that the means of the experimental group were higher than control group. According to this result, we can say that the research project course having an effective content on the experimental group having high scientific attitudes. Morrison, Raab & Ingram (2009) and Kazempour (2008) also stated in their research that scientific attitude develops the views of teachers and pre-service teachers

on the nature of science; and that they can apply the certain aspects of science they learned during the teaching process on research processes, and consolidate their scientific attitudes through various experiences. In their research, Sundberg and Ottander (2013) asked pre-service teachers whether they were actively involved in any scientific activity in their early years. Fifty-four percent stated that they did not participate in any scientific activity. When we evaluate this result in terms of teacher training programs, it can be said that the courses and activities intended to improve scientific research skills will have a positive effect on scientific attitudes and research skills of pre-service teachers. Moreover, all the pre-service teachers participated this study have high «Scientific attitude» scores; however, the pre-service teachers who took the elective course "Research project on Child and Family" got higher scientific attitude scores than those who did not take the course. Kazempour (2008) also mentioned the impact of scientific attitude on the high positive attitude towards research courses in his study. As a result, it can be said that in the development of scientific attitudes of university students, as well as the presence of scientific research courses, the content of these courses and the way they are taught can also affect the students' scientific research attitudes positively or negatively (Demirbaş, 2009; Coulson, 1992).

5. Conclusions

We can tell that the opinions of pre service teachers are to encourage students' attitudes towards science at an early age. Pre-service teachers have good preparation to address many aspects of teacher professionalism, but are less ready to train for sustainability. The high exhibition of scientific behavior scores of pre-service teachers can be explained by the basic characteristics of the teaching profession and supporting of affective learning.

It is deemed necessary to develop child-centered approaches to start developing talents, attitudes and values for sustainable improvement starting from an early age in early childhood education. The teacher is the most important factor in sustainability training because teachers have the power to create better educated future generations. Factors such as teacher quality, teacher recruitment, teacher certification, and teacher salary are only the most important factors of professional development when continuous social changes and alternative pedagogical approaches are addressed within sustainability training. Teachers are one of the most effective, strong forces for equality, effectiveness, ethical principles and quality in education. Teachers are the key to sustainable training and global development. However, their pre-service training, recruitment, working conditions and in-service development are some of the important issues. Therefore, in the process of training pre-service teachers, the development of their scientific attitudes and transforming those attitudes into a way of life is a critical factor for sustainable professional development. It can be said that the candidates pre service

teachers have project course have high scientific attitudes as well as a high willingness to do scientific studies. Teachers are an important driving force in ensuring sustainable training. However, their pre-service training, working conditions and in-service development are some of the important issues that need to be addressed and investigated. Therefore, it is necessary to prepare curricula that will develop and support the teacher candidates' scientific attitudes during their pre-service training. When all the literature is analyzed, it can be noted that the number and level of research on the sustainability of preschool education and the effect of pre-service teachers' gaining scientific attitudes on their professional development is not sufficient. In this case, longitudinal and in-depth research that will support the informing of teachers about sustainability training and contribute by improving the scientific attitudes of pre-service teachers should be included.

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